DOCUMENT RESUME

ED 249 719 EC 170 821

AUTHOR	Slavin, Robert E.
TITLE	Effects of Cooperative Learning on Mainstreamed Academically Handicapped Children. Final Report.
INSTITUTION	Johns Hopkins Univ., Baltimore, Md. Center for Social Organization of Schools.
SPONS AGENCY	Department of Education, Washington, DC.
PUB DATE	Oct 83
GRANT	-00-80-01494
NOTE	33p.; Tables may not reproduce well.
PUB TYPE	Reports - Research/Technical (143)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	*Cooperation; Individual Instruction; Intermediate Grades; *Mainstreaming; Mathematics Achievement; *Mild Disabilities; *Peer Acceptance; *Small Group Instruction; Student Attitudes; *Teamwork

ABSTRACT

Two experiments were conducted to investigate the use in mainstreamed classes of team assisted individualization (TAI), in which students work on individualized units in heterogeneous, cooperative learning groups. Team reward systems are incorporated into the small group instruction format. The effects of the TAI approach on the achievement, attitudes, and behaviors of students in general and the behavior and peer acceptance of mainstreamed academically handicapped (MAH) students were measured over 8 weeks for 504 students in grades 3-5 in experiment 1; experiment 2 assessed the mathematics achievement effects of TAI on MAH and non-handicapped students in grades 3-5 (n=1,371) over a 24-week period. Results of experiment 2 confirmed the hypothesis that achievement effects were not seen for the MAH subsample in experiment 1 because of the brief duration of the study. Over the full 24-week experiment, MAH Ss in TAI classes gained much more on the mathematics scales than did their control group counterparts. In both studies, nonhandicappped Ss also gained markedly in mathematics achievement in the TAI classes as compared to control Ss. Results were also positive for the behavior and social acceptance of MAH Ss. Sociometric results indicated that when MAH Ss work in small groups with nonhandicapped classmates, they are better accepted than Ss not working in such groups. Implications of the TAI approach for mainstreaming were discussed. (CL)

Effects of Cooperative Learning on Mainstreamed Academically Handicapped Children

Grant No. G-00-80-01494

Final Report

Robert E. Slavin, Principal Investigator
Center for Social Organization of Schools
Johns Hopkins University

October, 1983

There has been a continuing debate over the past twenty years about the achievement and social effects of segregated vs. mainstreamed placements of students with mild academic handicaps (MAH), such as learning disabled and educable mentally retarded students. Such reviewers as Semmel, Gottlieb, and Robinson (1979) and Gottlieb (1981) question the benefits of mainstreaming MAH students, principally on the basis that these students remain socially isolated and rejected in regular class settings. Others (e.g., Strain & Kerr, 1981) have concluded that the research in this area is too flawed to yield firm conclusions, while Leinhardt and Pallay (1982) have argued that what is important is which programs are used, not the settings (segregated or mainstreamed) in which students are located. Madden and Slavin (in press) concluded that well-designed studies do indicate positive achievement and self-esteem effects of regular class placement on MAH students, particularly when the regular class uses instructional methods (such as individualized instruction) designed to accomodate diverse needs.

While the controversy over the effects of mainstreaming is sure to continue, this question has substantially diminished in practical importance. The passage of PL94-142 and widespread changes in special education practices have resulted in regular class placements for tens of thousands of MAH students who would have been assigned to self-contained special education classes fifteen years ago. The most important question to be answered now is what programs are most likely to make the experience of mainstreaming maximally positive for MAH students and, not incidentally, their non-handicapped classmates.

Research on optimal strategies for the mainstreamed classroom is at an early stage. At present, two strategies predominate: Individualized instruc-

tion (e.g., Leinhardt, 1980; Wang, 1982) and cooperative learning (e.g., Johnson & Johnson, 1980; Madden & Slavin, 1983; Ballard, Corman, Gottlieb, & Kaufman, 1977). The idea behind the use of individualized instruction in mainstreamed classrooms is essentially to meet the different instructional needs of academically handicapped and non- handicapped students in a common setting by treating <u>all</u> students as "special," in the sense that all students have unique strengths and weaknesses that must be addressed by appropriate instructional strategies. The very limited research on individualized instruction in mainstreamed classrooms has found positive achievement effects of these strategies only for "poor-prognosis" first-graders in reading (Leinhardt, 1980), though Wang (1982) found positive but non-significant trends for the achievement of mainstreamed MAH students in individualized as compared to class-paced methods. However, Meece and Wang (1982) found strong positive effects of individualized instruction on the social acceptance and self-esteem of mainstreamed MAH students.

Cooperative learning strategies (see Slavin, 1983) involve students working in mixed-ability learning groups, usually receiving rewards based on group performance or learning. Mainstreamed MAH students are distributed among various learning groups. The rationale for the use of cooperative learning strategies in mainstreamed classrooms is that such methods have been found to overcome such barriers to friendship and positive interaction as race and ethnicity (see Slavin, 1979, 1983) and thus might be expected to have similar effects on the even stronger barriers between MAH and non-handicapped students (see Gottlieb & Leyser, 1981; Madden & Slavin, in press). Further, certain cooperative learning methods have been consistently found to increase student achievement (see Slavin, in press), and thus might be expected to have positive effects on the achievement of mainstreamed MAH students. Research on

cooperative learning in mainstreamed classrooms has indicated positive effects of these strategies on social acceptance of MAH students (e.g., D. W. Johnson & R. Johnson, 1982; Madden & Slavin, 1983) and on positive interactions between MAH and non-handicapped classmates (e.g., R. Johnson & D. W. Johnson, 1981).

Research on Mainstreaming Strategies at Johns Hopkins University

In 1980, we began a three-year program of research at Johns Hopkins University under funding from the Office of Special Education, U.S. Department of Education. Our proposal was based on the idea of combining individualized instruction and cooperative learning to maximize the potential strengths of each of these strategies for meeting the needs of the mainstreamed classroom. In particular, we hoped to capitalize on the ability of individualized instruction to accomodate wide ranges of student skill levels, and on the ability of cooperative learning to motivate students to do academic work, to break down barriers to friendship and positive interaction, and to help solve the management problems we knew to be critical in individualized programs. We chose mathematics as a subject area because of the hierarchical organization of mathematics skills (e.g., learning of two-digit division depends totally on mastery of one-digit division), which we felt made individualization especially necessary in heterogeneous mathematics classes.

Our first study (Madden & Slavin, 1983) evaluated the use of cooperative learning methods in regular grade 3-6 mathematics classes containing academically handicapped students. The methods used involved students working in heterogeneous, cooperative learning teams, in which the teams received recognition based on the degree to which their members improved over their own past average on weekly quizzes. The program was successful in reducing social

rejections of the MAH students and significantly increased the academic achievement of all students. Academically handicapped students gained more in achievement in the cooperative classes than in control, but this difference was not statistically significant.

The Madden and Slavin (1983) study convinced us we were on the right track, and that cooperative interaction between academically handicapped and non-handicapped students was going to be an important component of an effective mainstreaming strategy. However, we felt that more had to be done to meet individual student needs in the highly heterogeneous classes in which MAH students were mainstreamed. We conducted an extensive review of the literature on mainstreaming, focusing in particular on strategies for improving the outcomes of mainstreaming (Madden & Slavin, in press). This review convinced us further of the need to combine cooperative learning with individualized instruction to maximize the social and academic effects of each.

Team Assisted Individualization

To bring about this combination of cooperative learning and individualized instruction, we developed a new instructional technique for use in heterogeneous classes, which came to be known as Team Assisted Individualization, or TAI (Slavin, Leavey, & Madden, in press) TAI involves having students work on individualized mathematics units in heterogeneous, cooperative learning groups. Students manage almost all checking, routing, and management of the individualized program, freeing the teacher to work with small groups of students (drawn from different teams) who are working on the same skills. A team reward system gives teams certificates and recognition based on the number of units completed each week by all team members and the accuracy of the units. Because students are working at their own levels, this means that all students

have an equal chance to contribute to their team scores.

The main features of TAI are described in more detail below.

1. Teams. Students are assigned to four- or five-member teams. Each team consists of a mix of high, average, and low achievers, boys and girls, academically handicapped students, and students of any ethnic groups in the class represented in the proportion they make up of the entire class. Every four weeks, students are reassigned to new teams.

2. Placement test. Students are pretested at the beginning of the project on mathematics operations. They are placed at the appropriate point in the individualized program based on their performance on the placement test.

3. Curriculum materials. For most of their mathematics instruction, students work on individualized curriculum materials covering addition, subtraction, multiplication, division, numeration, decimals, fractions, word problems, and introduction to algebra. These materials have the following subparts:

--An Instruction Sheet explaining the skill to be mastered and giving a step-by-step method of solving problems.

--Several Skillsheets, each consisting of twenty problems. Each skillsheet introduces a subskill that leads to final mastery of the entire skill.

--A Checkout, which consists of two parallel sets of ten items.

--A Final Test.

--Answer Sheets for Skillsheets, Checkouts, and Final Tests.

4. Team Study Method. Following the placement test, students are given a starting place in the individualized mathematics units. They work on their units in their teams, following these steps:

--Students form into pairs or triads within their teams. Students locate the unit they are working on and bring it to the team area. Each unit consists of the Instruction Sheet, Skillsheets, and Checkouts stapled together, and the Skillsheet Answer Sheets and Checkout Answer Sheets stapled together.

--In pairs, students exchange Answer Sheets with their partners. In triads, they give their Answer Sheets to the student on their left.

--Each student reads his or her Instruction Sheet, asking teammates or the teacher for help if necessary. Then, students begin with the first Skillsheet in their units.

--Each student works the first four problems on his or her own Skillsheet and and then has his or her partner check the answers against the Answer Sheet. If four are correct, the student goes directly to the next Skillsheet. If any are wrong, the student must try the next four problems, and so on until he or she gets one block of four problems correct. If they run into difficulties at this stage, students are encouraged to ask for help within their teams before asking the teacher for help.

--When a student gets four in a row correct on the last Skillsheet, he or she takes Checkout A, a ten-item quiz that resembles the last Skillsheet. On the Checkout, students work along until they are finished. A teammate scores the Checkout. If the student gets eight or

more of the ten problems correct, the teammate signs the Checkout to indicate that the student is certified by the team to take the Final Test. If the student does not get eight correct, the teacher is called in to explain any problems the student is having. The teacher might ask the student to work again on certain Skillsheet items. The student then takes Checkout B, a second ten-item test comparable in content and difficulty to Checkout A. Otherwise, students skip Checkout B and go straight to the Final Test. No student may take the Final Test until he or she had been passed by a teammate on a Checkout.

--When a student "checks out," he or she takes the Checkout to a student monitor from a different team to get the appropriate Final Test. The student then completes the Final Test, and the monitor scores it. Three different students serve as monitors each day.

5. Team Scores and Team Recognition. At the end of each week, the teacher computes a team score. This score is based on the average number of units covered by each team member and the accuracy of the Final Tests. Criteria are established for team performance. A high criterion is set for a team to be a "SUPERTEAM," a moderate criterion is established for a team to be a "GREATTEAM," and a minimum criterion is set for a team to be a "GOODTEAM." The teams meeting the "SUPERTEAM" and "GREATTEAM" criteria receive attractive certificates.

6. Teaching Groups. Every day, the teacher works with small groups of students who are at about the same point in the curriculum for 5-15 minute sessions. The purpose of these sessions is to introduce major concepts to students. In general, students have concepts introduced to them in the teach-

ing groups before they work on them in their individualized units. While the teacher works with a teaching group, other students continue to work in their teams on their individualized units.

7. Homework. Every day except Friday, students are given brief homework assignments based on the teaching group they are in.

8. Facts Tests. Twice each week, students are given three minute facts tests (usually multiplication or division facts). Students are given facts sheets to study at home to prepare for these tests.

9. Group-Paced Units. Every fourth week, the teacher stops the individualized program and teaches a lesson to the entire class covering such skills as geometry, measurement, and sets (which are not included in the individualized units).

Research on TAI in Mainstreamed Classrooms

Two principal field experiments have been conducted to evaluate the effects of TAI on MAH and non-handicapped students. These studies are described in the following sections.

Experiment 1

Experiment 1 (Slavin, Leavey, & Madden, in press; Slavin, Madden, & Leavey, in press) was the first full-scale evaluation of TAI. It was conducted to evaluate the effects of TAI on the achievement, attitudes, and behaviors of students in general, and the behavior and peer acceptance of mainstreamed academically handicapped students.

Experiment 1: Subjects and Design.

The subjects in Experiment 1 were 504 students in grades 3, 4, and 5 in a middle-class suburban Maryland school district. Eighty percent of the students were white, 15% were black, and 5% were Asian-American. Six percent of the students were receiving special education services for a serious learning problem at least one hour per day, and an additional 17% of the students were receiving other educational services, such a special reading or speech instruction. The students were in eighteen classes in six schools. The schools were randomly assigned to one of three conditions: Team Assisted Individualization (TAI), Individualization Instruction (II) without student teams, or control. These treatments are described below. One third, fourth, and fifth grade class was then selected to participate in the study in each school. The three treatments were implemented for eight weeks in Spring, 1981.

Experiment 1: Treatments

1. Team-Assisted Individualization (TAI). TAI was implemented as described above.

2. Individualized Instruction (II). The II group used the same curriculum materials and procedures as the TAI group with the following exceptions:

--Students worked individually, not in teams. They checked their own answer sheets for all SKillsheets and Checkouts. Criteria for going on (i.e., four correct for Skillsheets and eight out of ten for Checkouts) were the same as for TAI.

--Students did not receive team scores or certificates.

In all other respects, including curriculum organization, student monitors, teaching groups, and recordkeeping, the II treatment was identical to TAI.

3. Control. The control group used traditional methods for teaching mathematics, which consisted in every case of traditional texts and group-paced instruction, supplemented by small homogeneous teacher-directed math groups.

Experiment 1: Measures

1. Mathematics Achievement. The Mathematics Computation subscale of the Comprehensive Test of Basic Skills (CTBS), Level 2, Form S, was administered as a pre- and posttest of student mathematics achievement. The CTBS (rather than a curriculum-specific test) was used to be sure experimental and control classes would have equal opportunities to have their learning be registered on the test. No efforts were made to design the curriculum materials to correspond to the CTBS items.

2. Attitudes. Two eight-item attitude scales were given as pre- and post-tests. The scales were Liking of Math Class (e.g., "This math class is the best part of my school day"), and Self-Concept in Math (e.g., "I'm proud of my math work in this class;" "I worry a lot when I have to take a math test"). For each item, students marked either YES!, yes, no, or NO! Scores of negatively scored items were reversed, so that high scale scores indicated more positive attitudes.

3. Behavior Ratings. Teachers rated a sample of their students at pre- and posttesting on the School Social Behavior Rating Scale, or SSBRS. The subsamples consisted of all students receiving some form of special service for a learning problem (e.g., reading or math resource, speech, or special

education), plus a random selection of six other students. The SSBRS consists of four scales designed to elicit teacher ratings of student behavioral and interpersonal problems. The four scales were Classroom Behavior (e.g., "Does not attend to work"), Self-Confidence (e.g., "Becomes easily upset by failures"), Friendships (e.g., "Has few or no friends"), and Negative Peer Behavior (e.g., "Fights with other students"). There were six items in the Negative Peer Behavior Scale, and eight in the other three scales. A factor analysis using varimax rotation produced factor loadings consistent with the *a priori* scales.

4. *Peer Rating*. A peer rating fo a was given at pre- and posttesting to ass a acceptance and rejection of MAH students. Each student was given a class list and was asked to mark each classmate as "a best friend" or "okay." Two measures were derived from this. The first was the number of nominations as "best friend" received by MAH students. The second was the number of times MAH students were listed neither as "best friends" nor as "okay," taken to be an indication of rejection. Only within-sex choices for boys were analyzed, as there were very few MAH girls in the sample.

Experiment 1: Results

The data were analyzed by means of multiple regressions, where for each dependent variable (posttest), the R square for a full model including pretest, grade, and treatment was tested against the R square for pretest and grade.

Insert Tables 1 & 2 Here

The pre- and posttest means on all dependent variables taken on the full sample by treatment are shown in Table 1. Table 2 presents the results of the multiple regressions, including both the overall (3 x 1) results and each of the pairwise comparisons.

The results for the Comprehensive Test of Basic Skills (CTBS) indicated a marginally significant ($p<.07$) overall treatment effect, controlling for pretest and grade. The TAI group gained significantly more in achievement ($p<.03$) than the control group, while the II group gained marginally ($p<.09$) more than the control group. However, there were no significant differences between the TAI and II groups.

Results for the Liking of Math scale indicated a significant overall treatment effect, as well as significant differences between TAI and control and between II and control, with both experimental groups scoring higher than the control group, controlling for pretest and grade. There were no differences between TAI and II. Overall treatment effects were also found for Self-Concept in Math. TAI significantly exceeded control on this variable while II marginally ($p<.08$) exceeded the control group.

Statistically significant overall treatment effects beyond the .001 level were found for all four behavioral rating scales (see Tables 1 and 2). For Class Behavior, TAI students were rated as having significantly fewer problems, controlling for pretest and grade, than either control students or II students, but there were no differences between II and Control. On Self-Confidence, the control group was rated as having more problems than either TAI students or II students, and the TAI group had fewer problems reported than the II group. The control classes were also scored as having more friendship problems than either TAI classes or II classes, but there were no differences

between TAI and II. The same pattern of effects was seen for ratings of Negative Peer Behavior-- more problems were reported in the control classes than in the TAI or II classes, but there were no differences between TAI and II.

Insert Tables 3 & 4 Here

Tables 3 and 4 summarize the results of analyses for the MAH subsample (from Slavin, Madden, & Leavey, in press). Analyses of covariance indicated that TAI students exceeded control students on both sociometric measures (i.e., they gained more "best friends" nominations and were less often rejected). TAI students were also reported to have fewer problems than control students on all four behavior rating scales, and were higher in liking of math class. Interestingly, the same pattern of results was found for the comparison of II and control treatments, with the exception of the Classroom Behavior scale, on which there were no differences. TAI students exceeded II students only on the Classroom Behavior and Self-Confidence ratings, and on the Self-Concept in Math questionnaire scale. There were no achievement effects for the MAH subsample.

Thus, the results of Experiment 1 were encouraging in terms of the achievement, behavior, and attitudes of students in general and of the behavior, attitudes, and social acceptance of the MAH students. However, the failure to find achievement effects for the MAH students was disappointing. We hypothesized that this might be due to the brief duration of the study (8 weeks), and decided to replicate the TAI-Control comparison over a much longer period.

Experiment 2

Experiment 2 (Slavin, Madden, & Leavey, 1983) was conducted to assess the mathematics achievement effects of TAI on MAH and non-handicapped students over a longer time period (24 weeks) than in Experiment 1, which we felt might have been too brief to produce statistically significant effects on the achievement of the MAH subsample.

Experiment 2: Subjects and Design

The subjects were 1371 students in 59 third, fourth, and fifth grade mathematics classes in a suburban Maryland school district. Of these, 113, or 8.2%, were receiving special education services for one or more hours per day. Seven hundred nineteen students in 31 classes in five schools were assigned to the TAI program, and 652 students in 28 classes in three different schools matched on average California Achievement Test scores were assigned to the control group. Sixty-three of the students in the TAI classes and 50 of those in the control classes were receiving special education services. Teachers in schools selected into the experimental group volunteered to use TAI immediately, while teachers in control schools volunteered to participate with the understanding that they would use TAI the following school year. The experimental procedures were implemented over a 24-week period, from December, 1981 to May, 1982.

Experiment 2: Measures

The mathematics achievement measures were the Mathematics Computations and Concepts and Applications subscales of the Comprehensive Test of Basic Skills (CTBS). Third and most fourth graders took Level II, Form S of the CTBS, while fifth graders and fourth graders in combined 4-5 clases took Level H, Form U. District-administered California Achievement Test (CAT) scores were used as covariates in all analyses. Because of the different tests used at different grade levels, all CTBS and CAT scores were transformed to grade equivalent scores, to provide a common metric for all analyses.

Experiment 2: Treatments

1. Team Assisted Individualization (TAI). TAI was implemented as described above. Implementation checks spaced throughout the 24-week experimental period revealed that all teachers implemented the main components of TAI adequately.

2. Control. The control teachers continued to use their usual instructional methods, which consisted of whole class instruction usually supplemented by instruction to homogeneous subgroups. All control teachers used a single class instructional pace and made few special accomodations to the needs of the MAH students.

Experiment 2: Results

Table 5 summarizes the means and standard deviations (in grade equivalents) for all students, broken down by treatment and academically handicapped/non-handicapped status. Initial analyses revealed no pretest differences for either achievement variable.

Tables 5 & 6 About Here

Analyses of covariance for the full sample and the academically handicapped and non-handicapped subgroups are presented in Table 6. Highly significant treatments effects in favor of the TAI classes were found for Computations ($F(1,1358)=26.05$, $p<.001$) as well as Concepts and Applications ($F(1,1358)=11.46$, $p<.001$). Effects of handicap were significant for Computations but not Concepts and Applications, and there were no handicap by treatment interactions.

Separate analyses for academically handicapped and non-handicapped students corresponded to the trends apparent in the full-sample analyses. For both subgroups, TAI students learned significantly more than control students on both achievement measures.

The magnitude of the TAI-control group differences can be estimated by comparing pre-to-post gains for each group. For Computations, academically handicapped students in TAI classes gained .52 grade equivalents more than their control counterparts. The differences for Concepts and Applications were almost as large, .47 grade equivalent units. For non-handicapped students, the differences in favor of TAI were .42 and .23, respectively.

Discussion

The results of Experiment 2 supported our hypothesis that achievement effects were not seen for the MAH subsample in Experiment 1 because of the brief duration of the study. Over a full 24-week experiment, the MAH students in TAI classes gained much more (more than twice as many grade equivalents) on both mathematics scales than did their control group counterparts. As was the case in Experiment 1, the non-handicapped students also gained markedly in mathematics achievement in the TAI classes, as compared to the control groups. This is of course important in its own right, but it is particularly important for mainstreaming, because it is unlikely that many regular class teachers would employ a method that was effective only for their two or three academically handicapped students.

The results of Experiment 1 concerning the behavior and social acceptance of mainstreamed academically handicapped students are also quite positive. By the time of the posttest, the behavior of the TAI subsample was rated by teachers as not significantly different from that of non-handicapped students in the control group. This is in marked contrast to the situation at pretest, when the MAH students were rated as having many more problems than non-handicapped students. TAI academically handicapped students also gained significantly more than control MAH students in ratings as "best friends," and received fewer "rejection" choices than did their counterparts in the control group. On these measures, MAH students in the Individualized Instruction groups scored at a point between the TAI and control groups.

The sociometric results indicate that when MAH students work in small groups with non-handicapped classmates, they are better accepted than are students who do not work in such groups. This replicates findings for other

cooperative learning methods (e.g., Ballard, Corman, Gottlieb, & Kaufman, 1977; Johnson & Johnson, 1982; Madden & Slavin, 1983). Allport's (1954) contact theory, originally developed to explain when inter-racial contact would lead to improved race relations, can be easily extended to predict that when academically handicapped and non-handicapped students engage in non-superficial, cooperative activities, they will learn to like and respect one another (see Gottlieb & Leyser, 1981; Madden & Slavin, in press). However, it is interesting that the Individualized Instruction treatment without teams also had a positive effect on the acceptance of academically handicapped students. This suggests that individualization itself makes an important contribution to the acceptance of academically handicapped students. Other research on individualized instruction (e.g., Meece & Wang, 1982) bears this out; mainstreamed MAH students are better accepted in individualized instructional programs than in traditional clasrooms. One reason for this is probably that in individualized programs, academically handicapped students do not stand out from the rest of the class, as all students are working in the same ways on the same types of materials, and all students are experiencing about the same level of success (at their own leve's). A similar explanation would apply to the effects on student behavior. However, more research on the effects of individualized instruction on the social acceptance and behavior of academically handicapped classmates is needed before this can be understood.

The success of TAI in improving the social acceptance, behavior, and achievement of academically handicapped students has major implications for mainstreaming. It suggests that the academic needs of low-achieving handicapped students can be met in the regular classroom, in a context that improves the social acceptance and behavior of these students. Achievement, social acceptance, and behavior are the principal problems faced by academically han-

dicapped students (Madden & Slavin, in press) and in fact define them as academically handicapped in the first place

Madden and Slavin (in press) have noted that when mainstreaming has been found to improve the achievement, behavior, and self-concepts of academically handicapped students, it is almost always the case that the clasroom in which these students are mainstreamed is using individualized instruction in some form (see, for example, Calhoun & Elliot, 1977). Neither individualized instruction in special classes nor mainstreaming without individualized instruction is as effective as this combination for either social or academic outcomes. The research on TAI more directly substantiates this observation by demonstrating that at least one form of individualized instruction as used in mainstreamed classes creates markedly enhanced outcomes for MAH students.

However, it is important to note that in both studies, the social, behavioral, and achievement gains seen for the MAH students occurred as part of an effect of the TAI program on all students; there were no treatment by handicap interactions. Neither study provided any reason to believe that meeting the unique instructional needs of academically handicapped students is any more important than meeting the unique instructional needs of all students. Most research on cooperative learning (see Slavin, 1983) has also found that the achievement and social effects of these strategies fall equally on high, average, and low achievers. Perhaps the most effective instruction for the mainstreamed classroom is simply the most effective instruction for all students, and all students need to be treated as "special," in the sense that they have unique instructional as well as social needs.

If the conclusions of the Madden and Slavin (in press) review and the implications of the TAI research summarized here are correct, a major rethink-

ing of special education and mainstreaming may be necessary. The debate on the issue of mainstreaming students with mild academic handicaps revolves around two principles on which pro-mainstreaming and anti-mainstreaming advocates would agree: first, academically hkandicapped students need special help designed to remedy their academic deficits, and second, that academically handicapped students can profit from appropriately structured interactions with non-handicapped peers. As is suggested by the research on TAI, these principles need not be in opposition to one another. Individual needs can be met in the context of cooperative interaction between academically handicapped and non-handicapped students. One logical further step along these lines might be to have special education or resource teachers team-teach with regular class teachers in classes containing MAH and non-handicapped students. If these classes used some combination of cooperative learning and individualized instruction (as TAI), it would then be possible for the specially trained special education or resource teacher to provide special services to MAH students in the context of the regular class, without depriving these students of their need to belong to a high-status, cooperative group.

Further research is needed to explore alternative means of structuring the mainstreamed classroom. The studies summarized in this paper are small steps on what will hopefully become a long road of research on improving the mainstreamed classroom for all students.

References

Allport, G. The Nature of Prejudice. Cambridge, MA: Addison-Wesley, 1954.

Ballard, M., Corman, L., Gottlieb, J., & Kaufman, M. Improving the social status of mainstreamed retarded children. Journal of Educational Psychology, 1977, 69, 605-611.

Calhoun, G., & Elliott, R. Self concept and academic achievement of educable retarded and emotionally disturbed pupils. Exceptional Children, 1977, 44, 379-380.

Gottlieb, J. Mainstreaming: Fulfilling the promise? American Journal of Mental Deficiency, 1981, 86, 115-126.

Gottlieb, J., & Leyser, Y. Friendship between mentally retarded and nonretarded children. In S. Asher & J. Gottman, The Development of Children's Friendships. Cambridge: Cambridge University Press, 1981.

Johnson, D.W., & Johnson, R.T. Integrating handicapped students into the mainstream Exceptional Children, 1980, 47, 90-98.

Johnson, D.W., & Johnson, R.T. Effects of cooperative and individualistic intruction on handicapped and non-handicapped students. Journal of Social Psychology, 1982, 118, 257-268.

Johnson, R., and Johnson, D.W. Building friendships between handicapped and nonhandicapped students: Effects of cooperative and individualistic instruction. American Educational Research Journal, 1981, 18, 415-424.

Leinhardt, G. Transition rooms: Promoting maturation or reducing education? Journal of Educational Psychology, 1980, 72, 55-61.

Leinhardt, G., & Pallay, A. Restrictive educational settings: Exile or haven? Review of Educational Research, 1982, 52, 557-578.

Madden, N.A., & Slavin, R.E. Cooperative learning and social acceptance of mainstreamed academically handicapped students. Journal of Special Education, 1983, 17, 171-182.

Madden, N.A., & Slavin, R.E. Mainstreaming students with mild academic handicaps: Academic and social outcomes. Review of Educational Research, in press.

Meece, J., & Wang, M. A comparative study of social attitudes and behaviors of mildly handicapped children in two mainstreaming programs. Paper presented at the Annual Convention of the American Educational Association, New York, 1982.

Semmel, M., Gottlieb, J., & Robinson, N. Mainstreaming: Perspectives on educating handicapped children in the public schools. In D. Berliner (Ed.), Review of Research in Education. Washington, D.C.: American Educational Research Association, 1979.

Slavin, R.E. Effects of biracial learning teams on cross-racial friendships. Journal of Educational Psychology, 1979, 71, 381-387.

Slavin, R.E. Cooperative Learning. New York: Longman, 1983.

Slavin, R.E. When does cooperative learning increase student achievement? Psychological Bulletin, in press.

Slavin, R.E., Leavey, M., & Madden, N.A. Combining cooperative learning and individualized instruction: Effects on student mathematics achievement, attitudes, and behaviors. Elementary School Journal, in press.

Slavin, R.E., Madden, N.A., & Leavey, M. Effects of cooperative learning and individualized instruction on the social acceptance, achievement, and behavior of mainstreamed handicapped students. Exceptional Children, in press.

Slavin, R.E., Madden, N.A., & Leavey, M. Effects of Team Assisted Individualization on the mathematics achievement of academically handicapped and non-handicapped students. Submitted for publication, 1983.

Strain, P., & Kerr, M. Mainstreaming of Children in Schools-Research and Programmatic Issues. New York: Academic Press, Inc., 1981.

Wang, M. Effective mainstreaming is possible -- Provided that... Learning Research and Development Center, University of Pittsburgh, 1982.

Table 1

Means and Standard Deviations of
Achievement, Attitude, and Behavioral Rating
Variables by Treatment, Full Sample
Experiment 1

		TAI		II		Control	
		X	(S.D.)	X	(S.D.)	X	(S.D.)
CTBS Achievement	Pre	30.18	(10.08)	28.51	(11.59)	29.25	(11.27)
	Post	33.12	(9.43)	31.45	(11.31)	31.02	(11.86)
	N	138		148		148	
Liking of Math Class	Pre	24.37	(6.23)	25.02	(5.09)	23.23	(5.07)
	Post	25.09	(6.19)	25.51	(4.35)	21.93	(5.75)
	N	147		150		154	
Self-Concept in Math	Pre	24.87	(4.13)	24.23	(4.89)	24.56	(4.16)
	Post	25.80	(4.23)	24.97	(4.42)	24.40	(4.72)
	N	145		150		153	
Behavior Rating* Classroom Behavior	Pre	5.07	(4.85)	4.35	(5.37)	4.81	(5.88)
	Post	2.93	(3.43)	5.26	(7.85)	5.41	(5.85)
	N	58		68		83	
Behavior Rating* Self-Confidence	Pre	3.97	(3.76)	4.12	(5.32)	2.64	(3.55)
	Post	1.90	(2.80)	3.31	(5.05)	3.78	(4.57)
	N	58		67		83	
Behavior Rating* Friendships	Pre	1.95	(3.29)	4.46	(7.19)	2.00	(3.32)
	Post	1.57	(3.89)	2.79	(5.48)	3.17	(4.08)
	N	58		67		83	
Behavior Rating* Negative Peer Behavior	Pre	2.00	(3.13)	2.13	(4.08)	1.82	(3.00)
	Post	0.94	(1.94)	1.16	(2.58)	2.87	(3.76)
	N	49		67		83	

*For the behavioral ratings, high scores indicate more problems reported.
From Slavin, Leavey, & Madden, in press

Table 2

Results of Multiple Regressions, Full Sample
Experiment 1

	R^2 Total	R^2 Inc	F	d.f.	p <
CTBS					
Overall	.752	.003	2.76	2,431	.07
TAI vs Control	.769	.004	5.39	1,284	.03
TAI vs II	.721	.000	< 1	1,284	n.s.
II vs Control	.766	.002	2.90	1,294	.09
Liking of Math Class					
Overall	.327	.035	11.66	2,448	.001
TAI vs Control	.360	.035	16.37	1,299	.001
TAI vs II	.275	.000	< 1	1,295	n.s.
II vs Control	.312	.004	19.50	1,302	.001
Self-Concept in Math					
Overall	.410	.011	4.13	2,445	.01
TAI vs Control	.442	.014	7.28	1,296	.01
TAI vs II	.382	.003	1.28	1,293	n.s.
II vs Control	.406	.006	3.21	1,301	.08
Behavior Rating: Classroom Behavior					
Overall	.600	.041	10.43	2,204	.001
TAI vs Control	.672	.066	27.55	1,137	.001
TAI vs II	.471	.049	11.25	1,122	.001
II vs Control	.609	.000	< 1	1,147	n.s.
Behavior Rating: Self-Confidence					
Overall	.536	.071	15.52	2,203	.001
TAI vs Control	.577	.118	38.25	1,137	.001
TAI vs II	.478	.024	5.51	1,121	.03
II vs Control	.571	.032	10.88	1,146	.001
Behavior Rating: Friendships					
Overall	.549	.040	9.10	2,203	.001
TAI vs Control	.595	.036	12.15	1,137	.001
TAI vs II	.541	.001	< 1	1,121	n.s.
II vs Control	.549	.044	14.24	1,146	.001
Behavior Rating: Negative Peer Behavior					
Overall	.507	.075	20.80	2,194	.001
TAI vs Control	.526	.105	28.30	1,128	.001
TAI vs II	.405	.002	< 1	1,112	n.s.
II vs Control	.561	.088	29.24	1,146	.001

From Slavin, Leavey, & Madden, in press

TABLE 3

Means and Standard Deviations of Sociometric, Behavior Rating, Achievement, and Attitude Variables for Academically Handicapped Students by Treatment, Experiment 1

		TAI		II		Control	
		$\bar{x}$	S.D.	$\bar{x}$	S.D.	$\bar{x}$	S.D.
"Best Friends"	Pre	5.86	3.21	4.34	3.68	4.54	2.84
	Post	6.04	3.02	4.61	3.66	4.00	2.08
	N	22		18		23	
"[illegible]ctions"	Pre	2.85	2.37	4.52	2.88	4.22	2.92
	Post	2.49	2.43	3.60	2.72	4.77	2.65
	N	22		18		23	
Behavior Rating: Classroom Behavior*	Pre	7.48	5.47	6.06	7.20	7.33	6.85
	Post	3.84	2.70	8.29	9.77	8.35	6.42
	N	25		34		40	
Behavior Rating: Self-Confidence*	Pre	6.00	4.14	7.07	6.51	3.77	4.26
	Post	2.84	3.20	6.17	6.40	5.10	5.18
	N	25		29		40	
Behavior Rating: Friendships*	Pre	2.88	3.89	5.71	7.90	2.70	3.67
	Post	1.80	3.91	3.26	4.66	4.20	4.18
	N	25		34		40	
Behavior Rating: Negative Peer Behavior*	Pre	2.88	3.46	3.00	5.20	2.70	3.65
	Post	1.17	2.60	1.62	3.11	4.15	4.20
	N	18		34		40	
CTBS	Pre	27.6	12.1	22.8	10.3	24.9	11.5
	Post	27.2	12.3	25.3	11.6	25.4	13.0
	N	22		36		40	
Liking of Math Class	Pre	14.2	5.25	14.4	5.17	16.3	4.34
	Post	14.4	5.69	14.9	6.05	18.1	5.52
	N	27		37		39	
Self-Concept in Math	Pre	16.1	4.57	15.8	5.44	16.6	3.54
	Post	14.7	4.78	16.5	5.29	15.8	3.38
	N	27		37		39	

*Higher ratings indicate more serious problems.

From Slavin, Madden, & Leavey, in press.

TABLE 4

Results of Analyses of Covariance for Sociometric, Behavior Rating, Achievement, and Attitude Measures: Academically Handicapped Students, Experiment 1

	F	d.f.	p	Direction
"Best Friends"				
Overall	2.98	2,58	.06	
TAI vs. Control	5.91	1,41	.02	TAI > C
TAI vs. II	<1	1,36	n.s.	
II vs. Control	4.81	1,37	.04	II > C
"Rejections"				
Overall	4.55	2,58	.02	
TAI vs. Control	6.36	1,41	.02	TAI > C
TAI vs. II	<1	1,36	n.s.	
II vs. Control	5.32	1,37	.03	II > C
Behavior Ratings: Classroom Behavior				
Overall	8.87	2,94	.01	
TAI vs. Control	13.10	1,61	.001	TAI > C
TAI vs. II	10.37	1,55	.002	TAI > II
II vs. Control	<1	1,70	n.s.	
Behavior Ratings: Self-Confidence				
Overall	8.56	2,89	.001	
TAI vs. Control	31.87	1,61	.001	TAI > C
TAI vs. II	5.65	1,50	.03	TAI > II
II vs. Control	3.09	1,65	.09	II > C
Behavior Ratings: Friendships				
Overall	7.97	2,94	.001	
TAI vs. Control	14.82	1,61	.001	TAI > C
TAI vs. II	<1	1,55	n.s.	
II vs. Control	12.66	1,70	.001	II > C
Behavior Ratings: Negative Peer Behavior				
Overall	17.09	2,87	.001	
TAI vs. Control	22.15	1,54	.001	TAI > C
TAI vs. II	<1	1,48	n.s.	
II vs. Control	32.70	1,70	.001	II > C
CTBS				
Overall	1.44	2,93	n.s.	
TAI vs. Control	<1	1,58	n.s.	
TAI vs. II	2.24	1,54	n.s.	
II vs. Control	1.54	1,72	n.s.	
Liking of Math Class				
Overall	2.66	2,98	.08	
TAI vs. Control	3.69	1,62	.06	TAI > C
TAI vs. II	<1	1,60	n.s.	
II vs. Control	3.40	1,72	.07	II > C
Self-Concept in Math				
Overall	2.45	2,98	.10	
TAI vs. Control	1.10	1,62	n.s.	
TAI vs. II	3.67	1,60	.06	TAI > II
II vs. Control	1.79	1,72	n.s.	

From Slavin, Madden, & Leavey, in press

BEST COPY

Table 5

Means and Standard Deviations of Mathematics Achievement Scores in Grade Equivalents by Treatment and Handicap
Experiment 2

	TAI		CONTROL	
	$\bar{x}$	s	$\bar{x}$	s
Full Sample				
Computations				
CAT (Pre)	4.97	(1.54)	5.01	(1.61)
CTBS (Post)	6.34	(2.62)	5.96	(2.40)
N	717		646	
Concepts & Applications				
CAT (Pre)	5.58	(1.89)	5.58	(1.87)
CTBS (Post)	6.74	(2.40)	6.50	(2.39)
N	713		650	
Academically Handicapped Students				
Computations				
CAT (Pre)	4.13	(1.24)	3.82	(0.75)
CTBS (Post)	5.00	(1.60)	4.17	(1.37)
N	63		49	
Concepts & Applications				
CAT (Pre)	4.17	(1.71)	3.91	(1.12)
CTBS (Post)	5.27	(2.05)	4.54	(1.57)
N	60		50	
Non-Handicapped Students				
Computations				
CAT (Pre)	5.50	(1.54)	5.11	(1.62)
CTBS (Post)	6.47	(2.66)	6.11	(2.41)
N	654		597	
Concepts & Applications				
CAT (Pre)	5.71	(1.86)	5.72	(1.85)
CTBS (Post)	6.88	(2.38)	6.66	(2.38)
N	653		600	

From Slavin, Madden, & Leavey, 1983

Table 6

Individual-Level Analyses of Covariance
for Full, Academically Handicapped, and
Non-Handicapped Samples
Experiment 2

Full Sample	d.f.	M.S.	F	p<
Computations				
Treatment	1	65.83	26.03	.001
Handicap	1	11.58	4.58	.032
Treatment by Handicap	1	0.01	< 1	n.s.
Error	1358	2.53		
Concepts & Applications				
Treatment	1	20.55	11.46	.001
Handicap	1	0.87	< 1	n.s.
Treatment by Handicap	1	1.34	< 1	n.s.
Error	1358	1.79		
Academically Handicapped Students				
Computations				
Treatment	1	8.03	6.11	.015
Error	109	1.31		
Concepts & Applications				
Treatment	1	6.32	4.30	.040
Error	107	1.47		
Non-Handicapped Students				
Computations				
Treatment	1	60.42	23.02	.001
Error	1248	2.63		
Concepts & Applications				
Treatment	1	16.20	8.90	.003
Error	1250	1.82		

From Slavin, Madden, & Leavey, 1983

Articles Produced Under Grant No. G-00-80-01494

"Effects of Cooperative Learning on Mainstreamed Academically Handicapped Children"

Madden, N.A., & Slavin, R.E. Cooperative learning and social acceptance of mainstreamed academically handicapped students. Journal of Special Education, 1983, 17, 171-182.

Madden, N.A., & Slavin, R.E. Mainstreaming students with mild academic handicaps: Academic and social outcomes. Review of Educational Research, in press.

Slavin, R. E. Team Assisted Individualization: Cooperative learning and individualized instruction in the mainstreamed classroom. Exceptional Education Quarterly, in press.

Slavin, R.E., Leavey, M., & Madden, N.A. Combining cooperative learning and individualized instruction: Effects on student mathematics achievement, attitudes, and behaviors. Elementary School Journal, in press.

Slavin, R.E., Leavey, M., & Madden, N.A. Combining student teams and individualized instruction in mathematics: An extended evaluation. Paper presented at the Annual Convention of the American Educational Research Association, Montreal, 1983.

Slavin, R.E., Madden, N.A., & Leavey, M. Effects of cooperative learning and individualized instruction on the social acceptance, achievement, and behavior of mainstreamed handicapped students. Exceptional Children, in press.

Slavin, R.E., Madden, N.A., & Leavey, M. Effects of Team Assisted Individualization on the mathematics achievement of academically handicapped and non-handicapped students. Submitted for publication.